SEQUENCE LISTING

<110> Forschungszentrum Juelich GmbH

<120> Method for microbial production of amino acids of the
aspartate and/or glutamate family and agents which can
be used in said method

<130> 1

<140> 09/529,043
<141> 2000-04-03

<150> PCT/EP98/06210
<151> 1998-09-30

<160> 4

<170> PatentIn Ver. 2.1

<210> 1
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<213> Corynebacterium glutamicum

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<221> CDS
<222> (165)..(3587)
<223> pyruvate carboxylase

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ctatcaccct tggcggtctc ttgttgaaag gaataattac tcta gtg tcg act cac 176
                                                   Val Ser Thr His
                                                    1

aca tct tca acg ctt cca gca ttc aaa aag atc ttg gta gca aac cgc 224
Thr Ser Ser Thr Leu Pro Ala Phe Lys Lys Ile Leu Val Ala Asn Arg
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ggc gaa atc gcg gtc cgt gct ttc cgt gca gca ctc gaa acc ggt gca 272
Gly Glu Ile Ala Val Arg Ala Phe Arg Ala Ala Leu Glu Thr Gly Ala
             25   30   35

gcc acg gta gct att tac ccc cgt gaa gat cgg gga tca ttc cac cgc 320

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Ala Thr Val Ala Ile Tyr Pro Arg Glu Asp Arg Gly Ser Phe His Arg
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tct ttt gct tct gaa gct gtc cgc att ggt acc gaa ggc tca cca gtc   368
Ser Phe Ala Ser Glu Ala Val Arg Ile Gly Thr Glu Gly Ser Pro Val
         55                  60                      65

aag gcg tac ctg gac atc gat gaa att atc ggt gca gct aaa aaa gtt   416
Lys Ala Tyr Leu Asp Ile Asp Glu Ile Ile Gly Ala Ala Lys Lys Val
     70                  75                      80

aaa gca gat gcc att tac ccg gga tac ggc ttc ctg tct gaa aat gcc   464
Lys Ala Asp Ala Ile Tyr Pro Gly Tyr Gly Phe Leu Ser Glu Asn Ala
 85                  90                  95                  100

cag ctt gcc cgc gag tgt gcg gaa aac ggc att act ttt att ggc cca   512
Gln Leu Ala Arg Glu Cys Ala Glu Asn Gly Ile Thr Phe Ile Gly Pro
             105                 110                 115

acc cca gag gtt ctt gat ctc acc ggt gat aag tct cgc gcg gta acc   560
Thr Pro Glu Val Leu Asp Leu Thr Gly Asp Lys Ser Arg Ala Val Thr
         120                 125                 130

gcc gcg aag aag gct ggt ctg cca gtt ttg gcg gaa tcc acc ccg agc   608
Ala Ala Lys Lys Ala Gly Leu Pro Val Leu Ala Glu Ser Thr Pro Ser
     135                 140                 145

aaa aac atc gat gag atc gtt aaa agc gct gaa ggc cag act tac ccc   656
Lys Asn Ile Asp Glu Ile Val Lys Ser Ala Glu Gly Gln Thr Tyr Pro
     150                 155                 160

atc ttt gtg aag gca gtt gcc ggt ggt ggc gga cgc ggt atg cgt ttt   704
Ile Phe Val Lys Ala Val Ala Gly Gly Gly Gly Arg Gly Met Arg Phe
                     170                 175                 180
165

gtt gct tca cct gat gag ctt cgc aaa tta gca aca gaa gca tct cgt   752
Val Ala Ser Pro Asp Glu Leu Arg Lys Leu Ala Thr Glu Ala Ser Arg
                 185                 190                 195

gaa gct gaa gcg gct ttc ggc gat ggc gcg gta tat gtc gaa cgt gct   800
Glu Ala Glu Ala Ala Phe Gly Asp Gly Ala Val Tyr Val Glu Arg Ala
             200                 205                 210

gtg att aac cct cag cat att gaa gtg cag atc ctt ggc gat cac act   848
Val Ile Asn Pro Gln His Ile Glu Val Gln Ile Leu Gly Asp His Thr
             215                 220                 225

gga gaa gtt gta cac ctt tat gaa cgt gac tgc tca ctg cag cgt cgt   896
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2

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Gly Glu Val Val His Leu Tyr Glu Arg Asp Cys Ser Leu Gln Arg Arg
    230                 235                 240

cac caa aaa gtt gtc gaa att gcg cca gca cag cat ttg gat cca gaa      944
His Gln Lys Val Val Glu Ile Ala Pro Ala Gln His Leu Asp Pro Glu
245                 250                 255                 260

ctg cgt gat cgc att tgt gcg gat gca gta aag ttc tgc cgc tcc att      992
Leu Arg Asp Arg Ile Cys Ala Asp Ala Val Lys Phe Cys Arg Ser Ile
                265                 270                 275

ggt tac cag ggc gcg gga acc gtg gaa ttc ttg gtc gat gaa aag ggc      1040
Gly Tyr Gln Gly Ala Gly Thr Val Glu Phe Leu Val Asp Glu Lys Gly
                280                 285                 290

aac cac gtc ttc atc gaa atg aac cca cgt atc cag gtt gag cac acc      1088
Asn His Val Phe Ile Glu Met Asn Pro Arg Ile Gln Val Glu His Thr
                295                 300                 305

gtg act gaa gaa gtc acc gag gtg gac ctg gtg aag gcg cag atg cgc      1136
Val Thr Glu Glu Val Thr Glu Val Asp Leu Val Lys Ala Gln Met Arg
    310                 315                 320

ttg gct gct ggt gca acc ttg aag gaa ttg ggt ctg acc caa gat aag      1184
Leu Ala Ala Gly Ala Thr Leu Lys Glu Leu Gly Leu Thr Gln Asp Lys
325                 330                 335                 340

atc aag acc cac ggt gca gca ctg cag tgc cgc atc acc acg gaa gat      1232
Ile Lys Thr His Gly Ala Ala Leu Gln Cys Arg Ile Thr Thr Glu Asp
                345                 350                 355

cca aac aac ggc ttc cgc cca gat acc gga act atc acc gcg tac cgc      1280
Pro Asn Asn Gly Phe Arg Pro Asp Thr Gly Thr Ile Thr Ala Tyr Arg
                360                 365                 370

tca cca ggc gga gct ggc gtt cgt ctt gac ggt gca gct cag ctc ggt      1328
Ser Pro Gly Gly Ala Gly Val Arg Leu Asp Gly Ala Ala Gln Leu Gly
        375                 380                 385

ggc gaa atc acc gca cac ttt gac tcc atg ctg gtg aaa atg acc tgc      1376
Gly Glu Ile Thr Ala His Phe Asp Ser Met Leu Val Lys Met Thr Cys
    390                 395                 400

cgt ggt tcc gac ttt gaa act gct gtt gct cgt gca cag cgc gcg ttg      1424
Arg Gly Ser Asp Phe Glu Thr Ala Val Ala Arg Ala Gln Arg Ala Leu
405                 410                 415                 420

gct gag ttc acc gtg tct ggt gtt gca acc aac att ggt ttc ttg cgt      1472
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Ala Glu Phe Thr Val Ser Gly Val Ala Thr Asn Ile Gly Phe Leu Arg
                425                 430                 435


gcg ttg ctg cgg gaa gag gac ttc act tcc aag cgc atc gcc acc gga    1520
Ala Leu Leu Arg Glu Glu Asp Phe Thr Ser Lys Arg Ile Ala Thr Gly
                440                 445                 450


ttc att gcc gat cac ccg cac ctc ctt cag gct cca cct gct gat gat    1568
Phe Ile Ala Asp His Pro His Leu Leu Gln Ala Pro Pro Ala Asp Asp
                455                 460                 465


gag cag gga cgc atc ctg gat tac ttg gca gat gtc acc gtg aac aag    1616
Glu Gln Gly Arg Ile Leu Asp Tyr Leu Ala Asp Val Thr Val Asn Lys
            470                 475                 480


cct cat ggt gtg cgt cca aag gat gtt gca gct cct atc gat aag ctg    1664
Pro His Gly Val Arg Pro Lys Asp Val Ala Ala Pro Ile Asp Lys Leu
485                 490                 495                 500


cct aac atc aag gat ctg cca ctg cca cgc ggt tcc cgt gac cgc ctg    1712
Pro Asn Ile Lys Asp Leu Pro Leu Pro Arg Gly Ser Arg Asp Arg Leu
                505                 510                 515


aag cag ctt ggc cca gcc gcg ttt gct cgt gat ctc cgt gag cag gac    1760
Lys Gln Leu Gly Pro Ala Ala Phe Ala Arg Asp Leu Arg Glu Gln Asp
                520                 525                 530


gca ctg gca gtt act gat acc acc ttc cgc gat gca cac cag tct ttg    1808
Ala Leu Ala Val Thr Asp Thr Thr Phe Arg Asp Ala His Gln Ser Leu
                535                 540                 545


ctt gcg acc cga gtc cgc tca ttc gca ctg aag cct gcg gca gag gcc    1856
Leu Ala Thr Arg Val Arg Ser Phe Ala Leu Lys Pro Ala Ala Glu Ala
            550                 555                 560


gtc gca aag ctg act cct gag ctt ttg tcc gtg gag gcc tgg ggc ggc    1904
Val Ala Lys Leu Thr Pro Glu Leu Leu Ser Val Glu Ala Trp Gly Gly
565                 570                 575                 580


gcg acc tac gat gtg gcg atg cgt ttc ctc ttt gag gat ccg tgg gac    1952
Ala Thr Tyr Asp Val Ala Met Arg Phe Leu Phe Glu Asp Pro Trp Asp
                585                 590                 595


agg ctc gac gag ctg cgc gag gcg atg ccg aat gta aac att cag atg    2000
Arg Leu Asp Glu Leu Arg Glu Ala Met Pro Asn Val Asn Ile Gln Met
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ctg ctt cgc ggc cgc aac acc gtg gga tac acc ccg tac cca gac tcc    2048
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4

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Leu Leu Arg Gly Arg Asn Thr Val Gly Tyr Thr Pro Tyr Pro Asp Ser
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gtc tgc cgc gcg ttt gtt aag gaa gct gcc agc tcc ggc gtg gac atc    2096
Val Cys Arg Ala Phe Val Lys Glu Ala Ala Ser Ser Gly Val Asp Ile
        630                 635                 640


ttc cgc atc ttc gac gcg ctt aac gac gtc tcc cag atg cgt cca gca    2144
Phe Arg Ile Phe Asp Ala Leu Asn Asp Val Ser Gln Met Arg Pro Ala
645                 650                 655                 660


atc gac gca gtc ctg gag acc aac acc gcg gta gcc gag gtg gct atg    2192
Ile Asp Ala Val Leu Glu Thr Asn Thr Ala Val Ala Glu Val Ala Met
                665                 670                 675


gct tat tct ggt gat ctc tct gat cca aat gaa aag ctc tac acc ctg    2240
Ala Tyr Ser Gly Asp Leu Ser Asp Pro Asn Glu Lys Leu Tyr Thr Leu
                680                 685                 690


gat tac tac cta aag atg gca gag gag atc gtc aag tct ggc gct cac    2288
Asp Tyr Tyr Leu Lys Met Ala Glu Glu Ile Val Lys Ser Gly Ala His
                695                 700                 705


atc ttg gcc att aag gat atg gct ggt ctg ctt cgc cca gct gcg gta    2336
Ile Leu Ala Ile Lys Asp Met Ala Gly Leu Leu Arg Pro Ala Ala Val
        710                 715                 720


acc aag ctg gtc acc gca ctg cgc cgt gaa ttc gat ctg cca gtg cac    2384
Thr Lys Leu Val Thr Ala Leu Arg Arg Glu Phe Asp Leu Pro Val His
725                 730                 735                 740


gtg cac acc cac gac act gcg ggt ggc cag ctg gca acc tac ttt gct    2432
Val His Thr His Asp Thr Ala Gly Gly Gln Leu Ala Thr Tyr Phe Ala
                745                 750                 755


gca gct caa gct ggt gca gat gct gtt gac ggt gct tcc gca cca ctg    2480
Ala Ala Gln Ala Gly Ala Asp Ala Val Asp Gly Ala Ser Ala Pro Leu
                760                 765                 770


tct ggc acc acc tcc cag cca tcc ctg tct gcc att gtt gct gca ttc    2528
Ser Gly Thr Thr Ser Gln Pro Ser Leu Ser Ala Ile Val Ala Ala Phe
                775                 780                 785


gcg cac acc cgt cgc gat acc ggt ttg agc ctc gag gct gtt tct gac    2576
Ala His Thr Arg Arg Asp Thr Gly Leu Ser Leu Glu Ala Val Ser Asp
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ctc gag ccg tac tgg gaa gca gtg cgc gga ctg tac ctg cca ttt gag    2624
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5

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Leu Glu Pro Tyr Trp Glu Ala Val Arg Gly Leu Tyr Leu Pro Phe Glu
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tct gga acc cca ggc cca acc ggt cgc gtc tac cgc cac gaa atc cca     2672
Ser Gly Thr Pro Gly Pro Thr Gly Arg Val Tyr Arg His Glu Ile Pro
                   825               830               835


ggc gga cag ttg tcc aac ctg cgt gca cag gcc acc gca ctg ggc ctt     2720
Gly Gly Gln Leu Ser Asn Leu Arg Ala Gln Ala Thr Ala Leu Gly Leu
               840               845               850


gcg gat cgt ttc gaa ctc atc gaa gac aac tac gca gcc gtt aat gag     2768
Ala Asp Arg Phe Glu Leu Ile Glu Asp Asn Tyr Ala Ala Val Asn Glu
               855               860               865


atg ctg gga cgc cca acc aag gtc acc cca tcc tcc aag gtt gtt ggc     2816
Met Leu Gly Arg Pro Thr Lys Val Thr Pro Ser Ser Lys Val Val Gly
           870               875               880


gac ctc gca ctc cac ctc gtt ggt gcg ggt gtg gat cca gca gac ttt     2864
Asp Leu Ala Leu His Leu Val Gly Ala Gly Val Asp Pro Ala Asp Phe
885               890               895               900


gct gcc gat cca caa aag tac gac atc cca gac tct gtc atc gcg ttc     2912
Ala Ala Asp Pro Gln Lys Tyr Asp Ile Pro Asp Ser Val Ile Ala Phe
                   905               910               915


ctg cgc ggc gag ctt ggt aac cct cca ggt ggc tgg cca gag cca ctg     2960
Leu Arg Gly Glu Leu Gly Asn Pro Pro Gly Gly Trp Pro Glu Pro Leu
               920               925               930


cgc acc cgc gca ctg gaa ggc cgc tcc gaa ggc aag gca cct ctg acg     3008
Arg Thr Arg Ala Leu Glu Gly Arg Ser Glu Gly Lys Ala Pro Leu Thr
           935               940               945


gaa gtt cct gag gaa gag cag gcg cac ctc gac gct gat gat tcc aag     3056
Glu Val Pro Glu Glu Glu Gln Ala His Leu Asp Ala Asp Asp Ser Lys
           950               955               960


gaa cgt cgc aat agc ctc aac cgc ctg ctg ttc ccg aag cca acc gaa     3104
Glu Arg Arg Asn Ser Leu Asn Arg Leu Leu Phe Pro Lys Pro Thr Glu
965               970               975               980


gag ttc ctc gag cac cgt cgc cgc ttc ggc aac acc tct gcg ctg gat     3152
Glu Phe Leu Glu His Arg Arg Arg Phe Gly Asn Thr Ser Ala Leu Asp
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gat cgt gaa ttc ttc tac ggc ctg gtc gaa ggc cgc gag act ttg atc     3200
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6

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Asp Arg Glu Phe Phe Tyr Gly Leu Val Glu Gly Arg Glu Thr Leu Ile
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cgc ctg cca gat gtg cgc acc cca ctg ctt gtt cgc ctg gat gcg atc     3248
Arg Leu Pro Asp Val Arg Thr Pro Leu Leu Val Arg Leu Asp Ala Ile
        1015                1020                1025

tct gag cca gac gat aag ggt atg cgc aat gtt gtg gcc aac gtc aac     3296
Ser Glu Pro Asp Asp Lys Gly Met Arg Asn Val Val Ala Asn Val Asn
        1030                1035                1040

ggc cag atc cgc cca atg cgt gtg cgt gac cgc tcc gtt gag tct gtc     3344
Gly Gln Ile Arg Pro Met Arg Val Arg Asp Arg Ser Val Glu Ser Val
  1045                1050                1055                1060

acc gca acc gca gaa aag gca gat tcc tcc aac aag ggc cat gtt gct     3392
Thr Ala Thr Ala Glu Lys Ala Asp Ser Ser Asn Lys Gly His Val Ala
                1065                1070                1075

gca cca ttc gct ggt gtt gtc acc gtg act gtt gct gaa ggt gat gag     3440
Ala Pro Phe Ala Gly Val Val Thr Val Thr Val Ala Glu Gly Asp Glu
                1080                1085                1090

gtc aag gct gga gat gca gtc gca atc atc gag gct atg aag atg gaa     3488
Val Lys Ala Gly Asp Ala Val Ala Ile Ile Glu Ala Met Lys Met Glu
        1095                1100                1105

gca aca atc act gct tct gtt gac ggc aaa atc gat cgc gtt gtg gtt     3536
Ala Thr Ile Thr Ala Ser Val Asp Gly Lys Ile Asp Arg Val Val Val
        1110                1115                1120

cct gct gca acg aag gtg gaa ggt ggc gac ttg atc gtc gtc gtt tcc     3584
Pro Ala Ala Thr Lys Val Glu Gly Gly Asp Leu Ile Val Val Val Ser
  1125                1130                1135                1140

taa acctttctgt aaaaagcccc gcgtcttcct catggaggag gcggggcttt         3637


ttgggccaag atgggagatg ggtgagttgg atttggtctg attcgacact tttaagggca   3697

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<213> Corynebacterium glutamicum


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Glu Thr Gly Ala Ala Thr Val Ala Ile Tyr Pro Arg Glu Asp Arg Gly
            35   40   45

Ser Phe His Arg Ser Phe Ala Ser Glu Ala Val Arg Ile Gly Thr Glu
        50   55   60

Gly Ser Pro Val Lys Ala Tyr Leu Asp Ile Asp Glu Ile Ile Gly Ala
65   70   75   80

Ala Lys Lys Val Lys Ala Asp Ala Ile Tyr Pro Gly Tyr Gly Phe Leu
                85   90   95

Ser Glu Asn Ala Gln Leu Ala Arg Glu Cys Ala Glu Asn Gly Ile Thr
            100   105   110

Phe Ile Gly Pro Thr Pro Glu Val Leu Asp Leu Thr Gly Asp Lys Ser
            115   120   125

Arg Ala Val Thr Ala Ala Lys Lys Ala Gly Leu Pro Val Leu Ala Glu
    130   135   140

Ser Thr Pro Ser Lys Asn Ile Asp Glu Ile Val Lys Ser Ala Glu Gly
145   150   155   160

Gln Thr Tyr Pro Ile Phe Val Lys Ala Val Ala Gly Gly Gly Gly Arg
            165   170   175

Gly Met Arg Phe Val Ala Ser Pro Asp Glu Leu Arg Lys Leu Ala Thr
            180   185   190

Glu Ala Ser Arg Glu Ala Glu Ala Ala Phe Gly Asp Gly Ala Val Tyr
            195   200   205

Val Glu Arg Ala Val Ile Asn Pro Gln His Ile Glu Val Gln Ile Leu
    210   215   220

Gly Asp His Thr Gly Glu Val Val His Leu Tyr Glu Arg Asp Cys Ser
225   230   235   240

Leu Gln Arg Arg His Gln Lys Val Val Glu Ile Ala Pro Ala Gln His
            245   250   255

Leu Asp Pro Glu Leu Arg Asp Arg Ile Cys Ala Asp Ala Val Lys Phe
            260   265   270

Cys Arg Ser Ile Gly Tyr Gln Gly Ala Gly Thr Val Glu Phe Leu Val
    275   280   285

Asp Glu Lys Gly Asn His Val Phe Ile Glu Met Asn Pro Arg Ile Gln
    290   295   300

Val Glu His Thr Val Thr Glu Glu Val Thr Glu Val Asp Leu Val Lys
305   310   315   320

Ala Gln Met Arg Leu Ala Ala Gly Ala Thr Leu Lys Glu Leu Gly Leu
            325   330   335

Thr Gln Asp Lys Ile Lys Thr His Gly Ala Ala Leu Gln Cys Arg Ile
            340   345   350

Thr Thr Glu Asp Pro Asn Asn Gly Phe Arg Pro Asp Thr Gly Thr Ile
            355   360   365

Thr Ala Tyr Arg Ser Pro Gly Gly Ala Gly Val Arg Leu Asp Gly Ala

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          370                     375                     380
Ala Gln Leu Gly Gly Glu Ile Thr Ala His Phe Asp Ser Met Leu Val
385                     390                     395                     400
Lys Met Thr Cys Arg Gly Ser Asp Phe Glu Thr Ala Val Ala Arg Ala
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Gln Arg Ala Leu Ala Glu Phe Thr Val Ser Gly Val Ala Thr Asn Ile
                420                     425                     430
Gly Phe Leu Arg Ala Leu Leu Arg Glu Glu Asp Phe Thr Ser Lys Arg
                435                     440                     445
Ile Ala Thr Gly Phe Ile Ala Asp His Pro His Leu Leu Gln Ala Pro
        450                     455                     460
Pro Ala Asp Asp Glu Gln Gly Arg Ile Leu Asp Tyr Leu Ala Asp Val
465                     470                     475                     480
Thr Val Asn Lys Pro His Gly Val Arg Pro Lys Asp Val Ala Ala Pro
                485                     490                     495
Ile Asp Lys Leu Pro Asn Ile Lys Asp Leu Pro Leu Pro Arg Gly Ser
                500                     505                     510
Arg Asp Arg Leu Lys Gln Leu Gly Pro Ala Ala Phe Ala Arg Asp Leu
                515                     520                     525
Arg Glu Gln Asp Ala Leu Ala Val Thr Asp Thr Thr Phe Arg Asp Ala
        530                     535                     540
His Gln Ser Leu Leu Ala Thr Arg Val Arg Ser Phe Ala Leu Lys Pro
545                     550                     555                     560
Ala Ala Glu Ala Val Ala Lys Leu Thr Pro Glu Leu Leu Ser Val Glu
                565                     570                     575
Ala Trp Gly Gly Ala Thr Tyr Asp Val Ala Met Arg Phe Leu Phe Glu
                580                     585                     590
Asp Pro Trp Asp Arg Leu Asp Glu Leu Arg Glu Ala Met Pro Asn Val
                595                     600                     605
Asn Ile Gln Met Leu Leu Arg Gly Arg Asn Thr Val Gly Tyr Thr Pro
        610                     615                     620
Tyr Pro Asp Ser Val Cys Arg Ala Phe Val Lys Glu Ala Ala Ser Ser
625                     630                     635                     640
Gly Val Asp Ile Phe Arg Ile Phe Asp Ala Leu Asn Asp Val Ser Gln
                645                     650                     655
Met Arg Pro Ala Ile Asp Ala Val Leu Glu Thr Asn Thr Ala Val Ala
                660                     665                     670
Glu Val Ala Met Ala Tyr Ser Gly Asp Leu Ser Asp Pro Asn Glu Lys
                675                     680                     685
Leu Tyr Thr Leu Asp Tyr Tyr Leu Lys Met Ala Glu Glu Ile Val Lys
        690                     695                     700
Ser Gly Ala His Ile Leu Ala Ile Lys Asp Met Ala Gly Leu Leu Arg
705                     710                     715                     720
Pro Ala Ala Val Thr Lys Leu Val Thr Ala Leu Arg Arg Glu Phe Asp
                725                     730                     735
Leu Pro Val His Val His Thr His Asp Thr Ala Gly Gly Gln Leu Ala
                740                     745                     750
Thr Tyr Phe Ala Ala Ala Gln Ala Gly Ala Asp Ala Val Asp Gly Ala
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Ser Ala Pro Leu Ser Gly Thr Thr Ser Gln Pro Ser Leu Ser Ala Ile
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Val Ala Ala Phe Ala His Thr Arg Arg Asp Thr Gly Leu Ser Leu Glu
785                    790                    795                    800
Ala Val Ser Asp Leu Glu Pro Tyr Trp Glu Ala Val Arg Gly Leu Tyr
                  805                    810                    815
Leu Pro Phe Glu Ser Gly Thr Pro Gly Pro Thr Gly Arg Val Tyr Arg
                  820                    825                    830
His Glu Ile Pro Gly Gly Gln Leu Ser Asn Leu Arg Ala Gln Ala Thr
              835                    840                    845
Ala Leu Gly Leu Ala Asp Arg Phe Glu Leu Ile Glu Asp Asn Tyr Ala
          850                    855                    860
Ala Val Asn Glu Met Leu Gly Arg Pro Thr Lys Val Thr Pro Ser Ser
865                    870                    875                    880
Lys Val Val Gly Asp Leu Ala Leu His Leu Val Gly Ala Gly Val Asp
                  885                    890                    895
Pro Ala Asp Phe Ala Ala Asp Pro Gln Lys Tyr Asp Ile Pro Asp Ser
                  900                    905                    910
Val Ile Ala Phe Leu Arg Gly Glu Leu Gly Asn Pro Pro Gly Gly Trp
              915                    920                    925
Pro Glu Pro Leu Arg Thr Arg Ala Leu Glu Gly Arg Ser Glu Gly Lys
          930                    935                    940
Ala Pro Leu Thr Glu Val Pro Glu Glu Glu Gln Ala His Leu Asp Ala
945                    950                    955                    960
Asp Asp Ser Lys Glu Arg Arg Asn Ser Leu Asn Arg Leu Leu Phe Pro
                  965                    970                    975
Lys Pro Thr Glu Glu Phe Leu Glu His Arg Arg Arg Phe Gly Asn Thr
              980                    985                    990
Ser Ala Leu Asp Asp Arg Glu Phe Phe Tyr Gly Leu Val Glu Gly Arg
              995                   1000                   1005
Glu Thr Leu Ile Arg Leu Pro Asp Val Arg Thr Pro Leu Leu Val Arg
     1010                   1015                   1020
Leu Asp Ala Ile Ser Glu Pro Asp Asp Lys Gly Met Arg Asn Val Val
1025                   1030                   1035                   1040
Ala Asn Val Asn Gly Gln Ile Arg Pro Met Arg Val Arg Asp Arg Ser
                  1045                   1050                   1055
Val Glu Ser Val Thr Ala Thr Ala Glu Lys Ala Asp Ser Ser Asn Lys
                  1060                   1065                   1070
Gly His Val Ala Ala Pro Phe Ala Gly Val Val Thr Val Thr Val Ala
              1075                   1080                   1085
Glu Gly Asp Glu Val Lys Ala Gly Asp Ala Val Ala Ile Ile Glu Ala
          1090                   1095                   1100
Met Lys Met Glu Ala Thr Ile Thr Ala Ser Val Asp Gly Lys Ile Asp
1105                   1110                   1115                   1120
Arg Val Val Val Pro Ala Ala Thr Lys Val Glu Gly Gly Asp Leu Ile
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Val Val Val Ser
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<212> DNA
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<223> Description of Artificial Sequence: PCR primer

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<210> 4
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